

# **Effects of Stream Crossing Upgrading on Channel Erosion**

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# Problem Statement

- Numerous stream crossings are being upgraded on public and private lands in coastal counties.
- Construction-related impacts on water quality have triggered concerns amongst regulatory agencies and environmental activists.
- The magnitude and duration of these impacts have not been thoroughly studied.

# Study Design

- Twenty-nine stream crossings designated for upgrading were selected.
- Crossings are located on lands managed by Green Diamond Resource Company, Pacific Lumber Company and Hoopa Valley Indian Tribe.
- Data were collected prior to construction, immediately after construction and after the winter of 2005-06.

## Study Design (cont.)

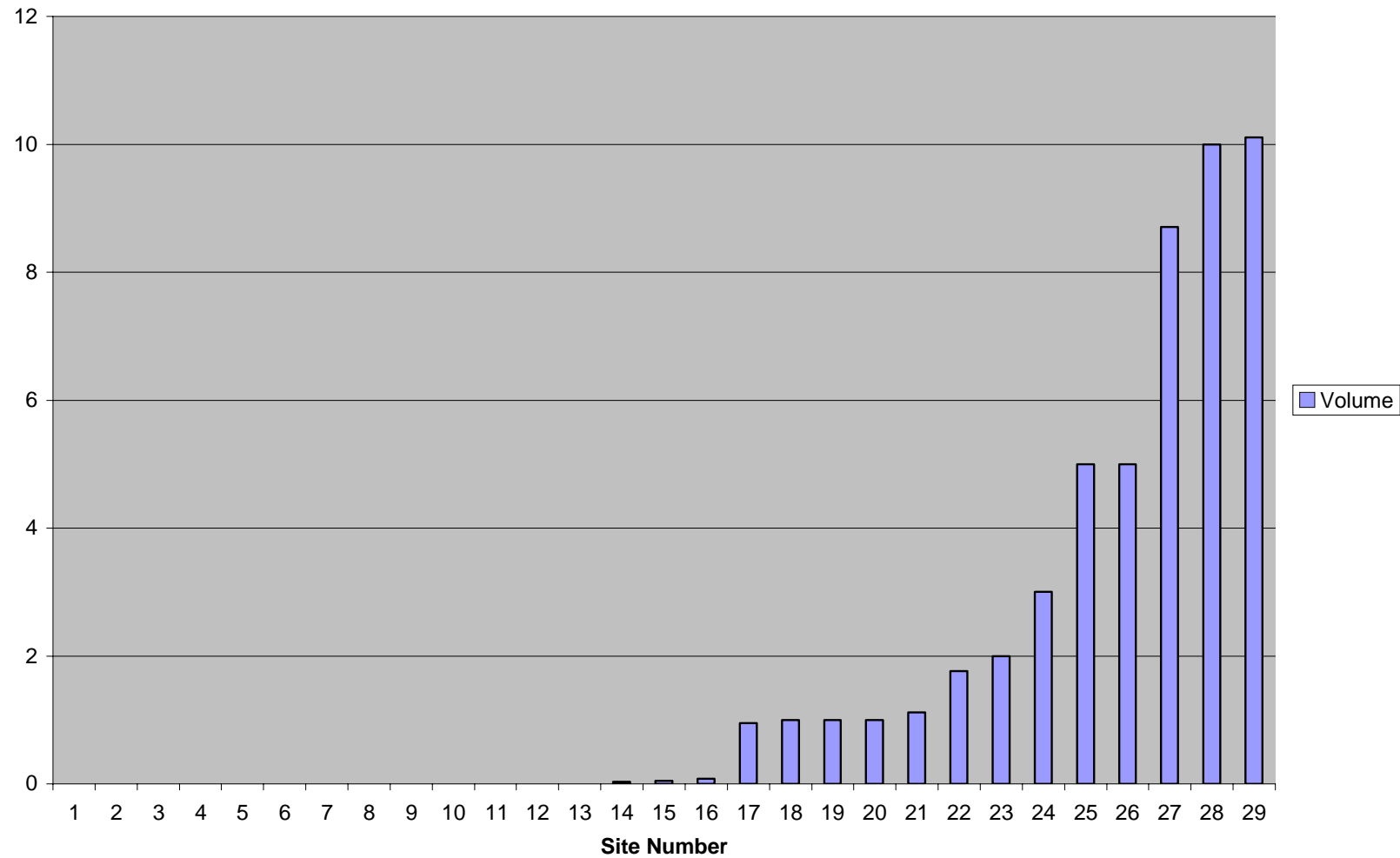
- Data collected included longitudinal profiles through each crossing and four cross sections upstream (2) and downstream (2) from inlets and outlets.
- In addition, discernible voids in channels and banks were measured.
- Pre- and post-construction photographs were taken from established photo-points.

# Analysis Procedures

- For each crossing, total erosion and presumed sediment delivery was quantified based on post-winter measurements.
- For each profile and cross section at crossings exhibiting adjustments, comparisons were made before and after the winter.
- Response variables were total erosion, depth and length of incision or deposition along profiles and change in cross sectional area.

# Results

Adjustment Volume Due to Upgrade



## Results (cont.)

- Thirteen of 29 sites showed no discernible erosion or sediment delivery.
- Only five sites produced more than five cubic yards of sediment.
- Maximum sediment production was about 10 cubic yards (at two sites).

## Results (cont.)

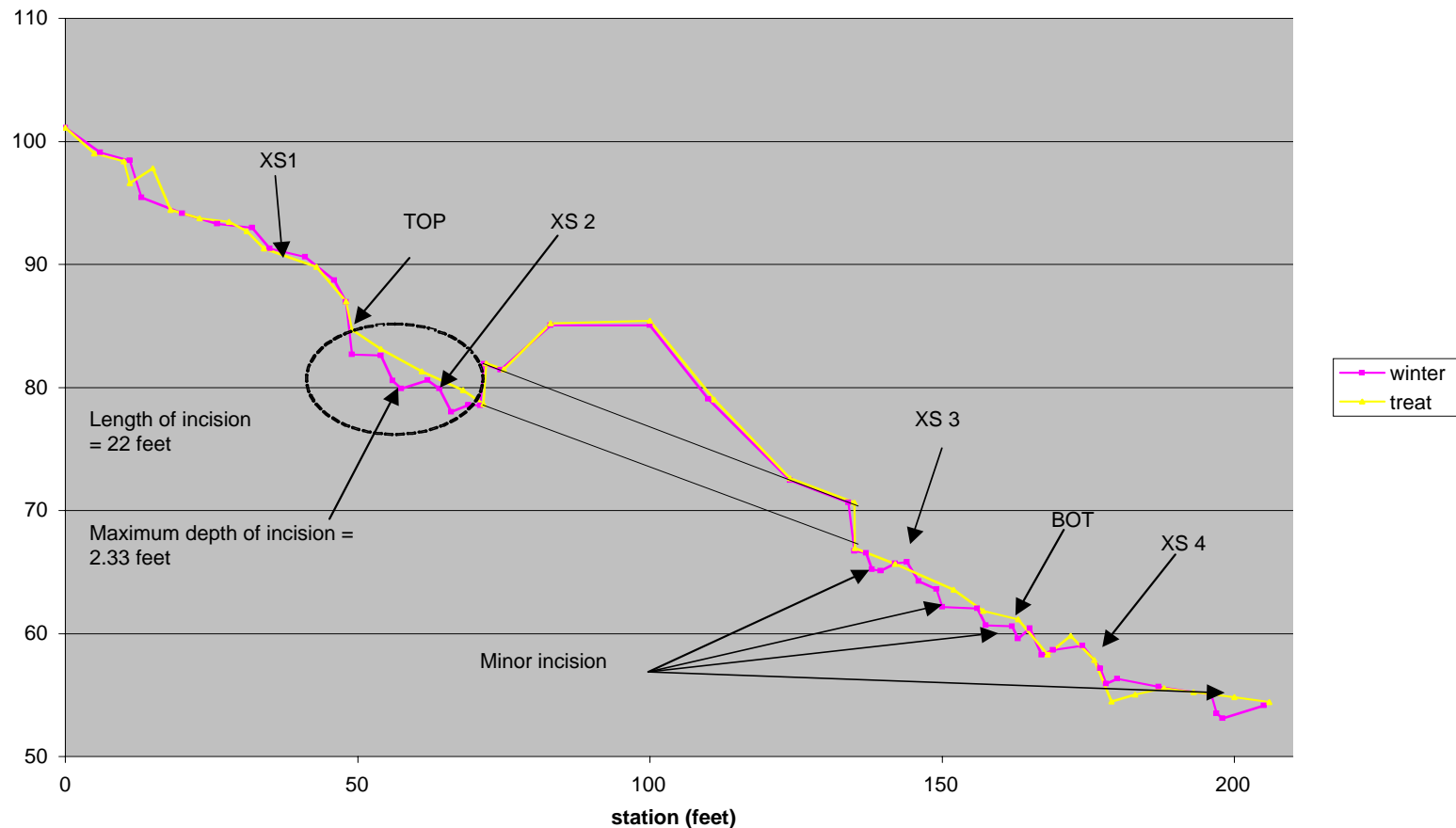
- Some sites at the Hoopa Valley Reservation experienced large changes, both aggradation and erosion.
- These changes were not attributable to upgrading but were due to large inputs of sediment from upstream landslides.



# Results (cont.)

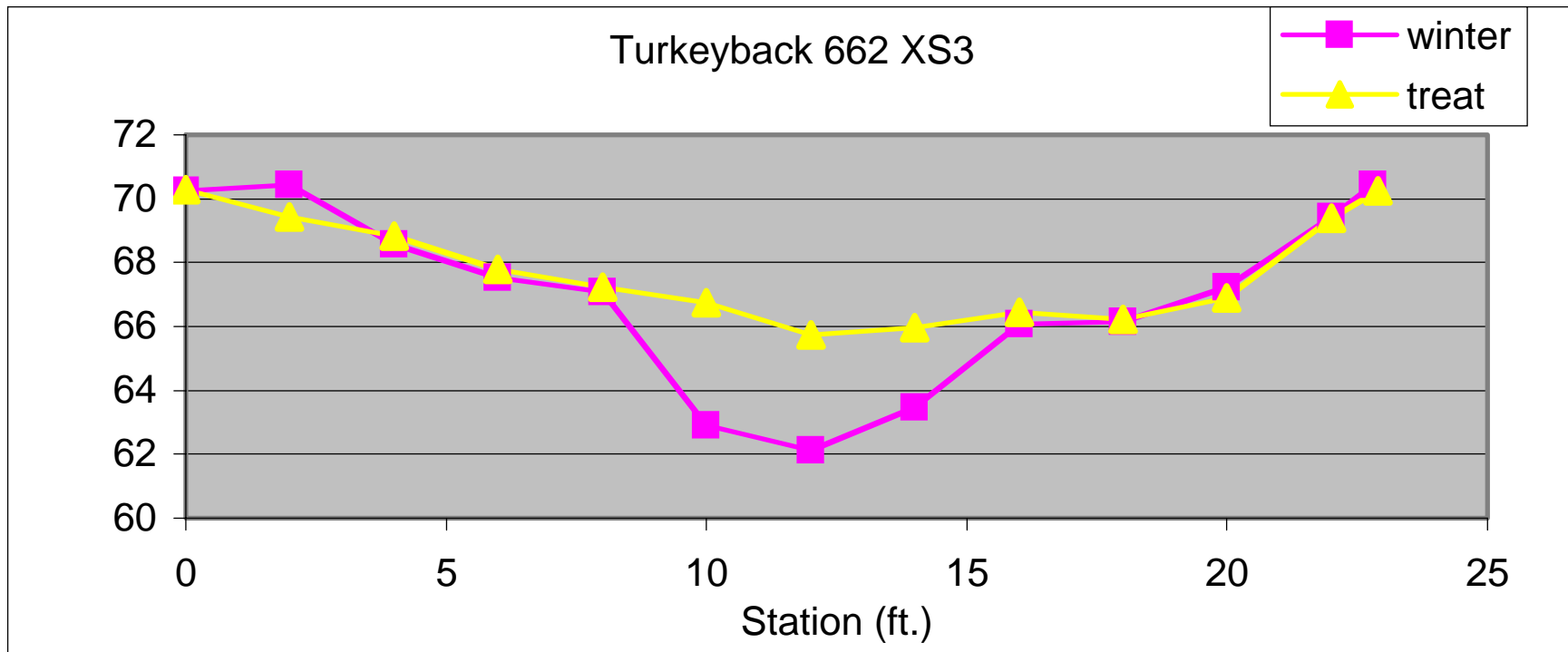
- Analysis of profiles indicated instances of channel incision ("TOP and BOT" indicate limits of excavation). Maximum depth of incision was about four feet. Maximum length of incision was about 40 feet.

Turkeyback 660



# Results (cont.)

- Few cross sections displayed significant changes. Cross sections were not sufficiently close enough to capture all channel changes. Void measurements were more useful.



# Palco Lands





# Palco Lands

After construction



After the winter





# Palco Lands

After construction



After the winter





# Hoopla Reservation

After construction



After the winter





# Hoopla Reservation

After construction



After the winter





# Green Diamond

After construction

After the winter





# Green Diamond

After construction

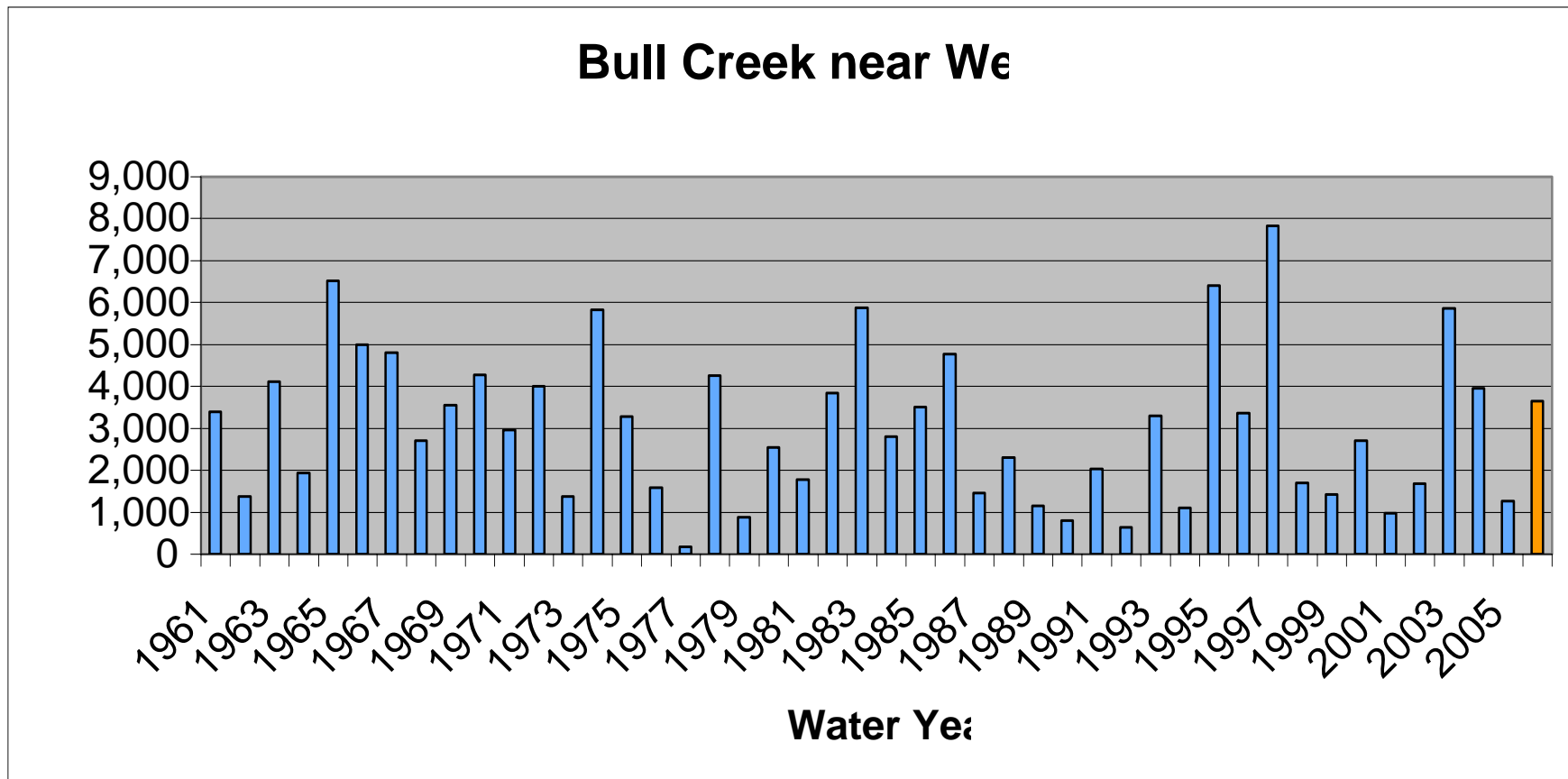


After the winter



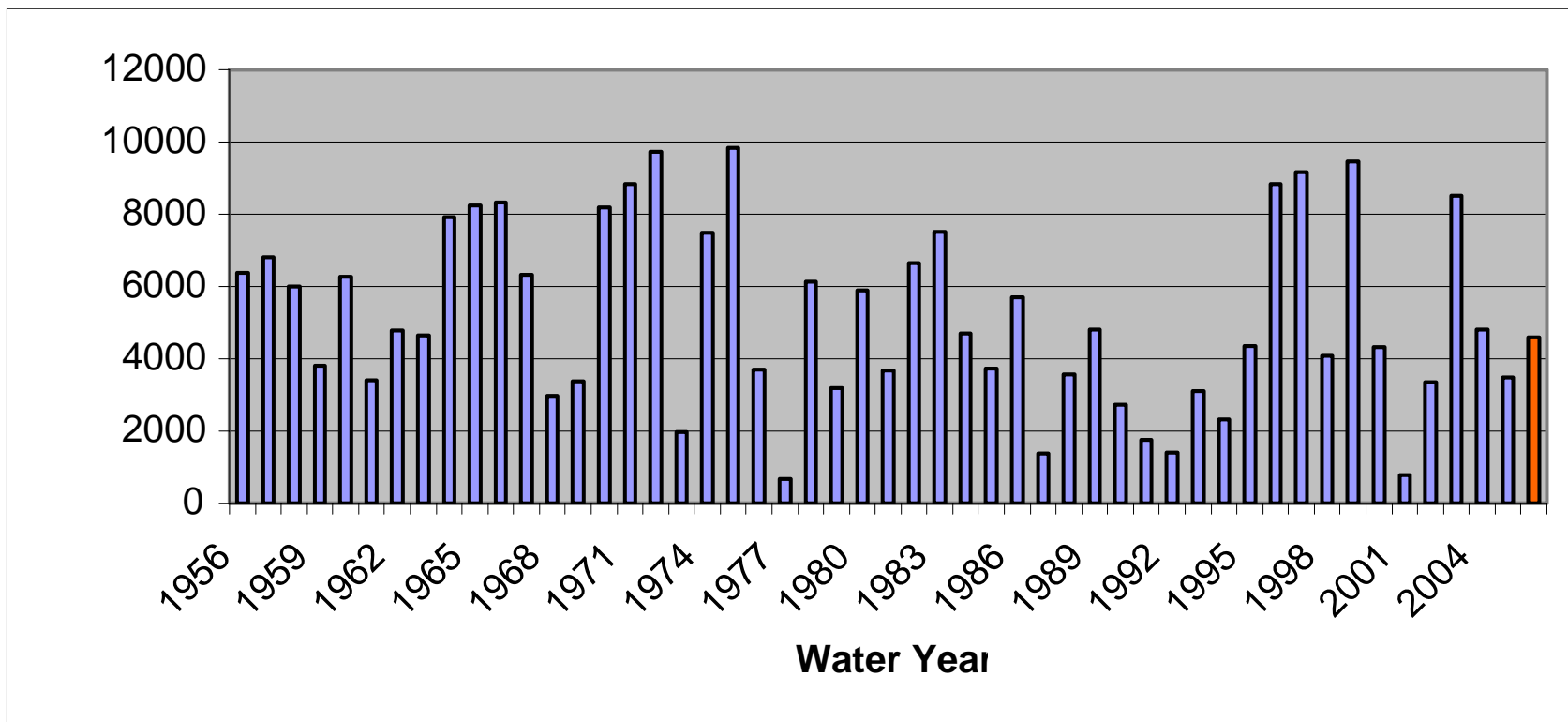
# Weather Conditions

- Available data indicates that the winter of 2005-06 was of moderate severity in most places. Precipitation events never exceeded a two-year recurrence interval storm as recorded at Humboldt County stations.
- Streamflow: Bull Creek experienced a 3.5 year recurrence interval peak flow (nearest station to Palco).



# Weather Conditions (cont.)

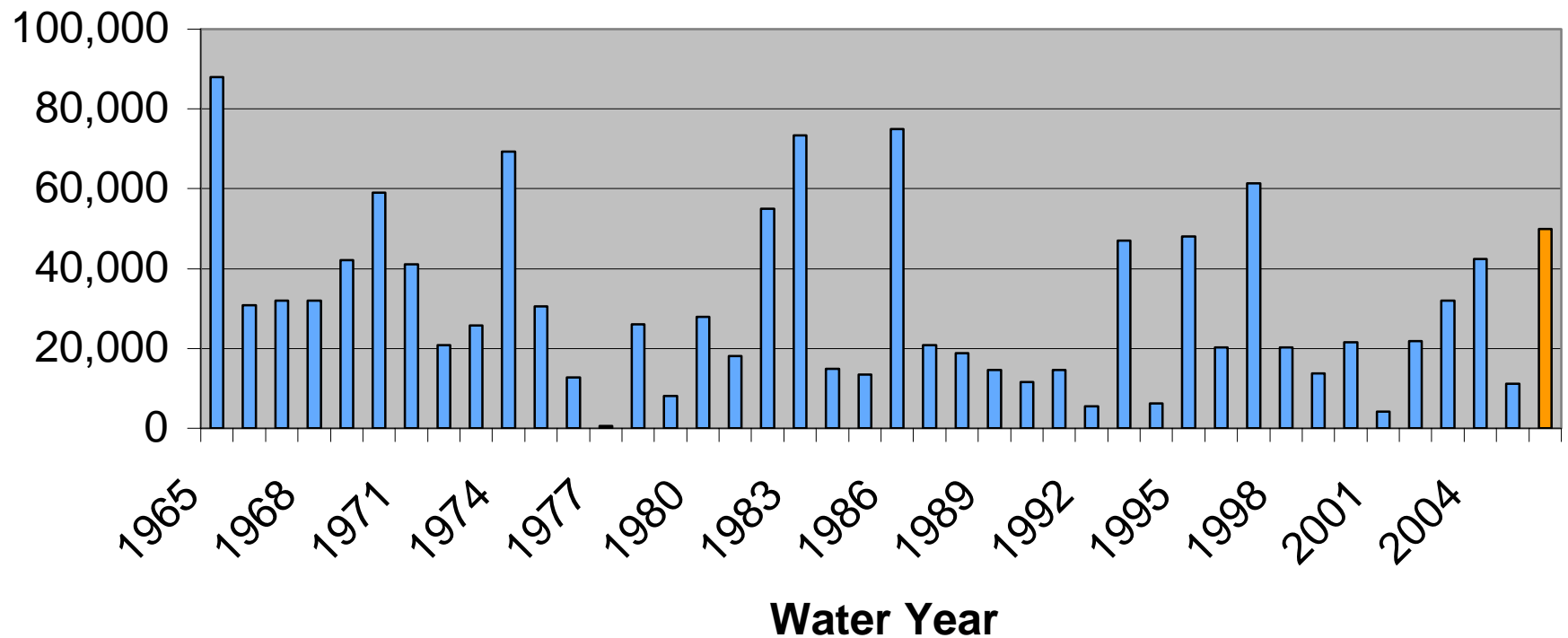
- The Little River experienced a two-year recurrence interval peak flow (nearest station to Green Diamond).



# Weather Conditions (cont.)

- Unregulated South Fork Trinity experienced a 7.5 year recurrence interval discharge (nearest to Hoopa).

**South Fork Trinity River near Hyampom**



# Discussion

- Erosion control measures implemented at our study sites were effective in preventing construction-related adjustments *after one winter*.
- Seventeen percent of our crossings accounted for 76 percent of measured erosion. This compares well with Madej (2001) who found that 20 percent of her measured decommissioned crossings accounted for 73 percent of adjustment.

## Discussion (cont.)

- The amount of erosion we measured was much less than measured erosion on decommissioned sites. Our average adjustment over all 29 sites was only 1.75 cubic yards as compared to 15.5 cubic yards (Klein, Mattole River), 17 cubic yards (PWA, Elk River) and 65 cubic yards (Madej 2001, Redwood Creek).
- Less erosion because of pipe versus natural bottoms, extensive erosion control measures and perhaps, a mild winter.

# Conclusions and Questions

- Methodology: long profiles and void measurements were adequate to quantify erosion. Cross sections probably not needed.
- Performance: upgraded sites on *Timber Harvest Plans* perform well and eliminate potentially large sediment sources.

# Conclusions and Questions (cont.)

- Uncertainty: how will these crossings behave in the future under more stressful weather events?
- Representation: how do these treatments compare to treatments on other, non-timber related upgrade sites?



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Thank you for listening!

